Molecular robots under construction: amoeba-type artificial cell model

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We have composed an amoeba-like molecular robot, which exhibits motility (e.g. changing shape) by molecular motors controlled by an artificial DNA signal. All of the molecular components (molecular motors, clutch system, energy regeneration system, etc.) were integrated into microcapsule (giant vesicle) made of lipid bilayer membrane (Figure 1). The vesicle showed continuous shape changing behavior, and it was stopped by the DNA signal. The process vice versa, namely, the shape change can be initiated by an input of the signal. These results show that the components of the robot were consistently integrated into a functional system. We expect that this study can provide a platform to build increasingly complex and functional molecular systems with controllable motility. In this talk, we also would like to introduce a possible application of giant vesicle technology for bioengineering field [1].

Figure 1. Amoeba-type molecular robot based on giant liposome (vesicle) technology. (a) Schematic images of the robot, and (b) the 3D view reconstituted from laser scanning microscopic images.

Reference: